FINAL REPORT
NOVEMBER 1989

EVT 3-90

MIL-STD-398 EXPLOSIVE TEST OF BARRICADE FOR VOLCANO MOPMS CARTRIDGE ASSEMBLY

Prepared for:

Lone Star Army Ammunition Plant
ATTN: SMCLS-SF
Texarkana, TX 75501-9101

EVALUATION DIVISION
SAVANNA, ILLINOIS 61074-9639

US ARMY
ARMAMENT
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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The U.S. Army Defense Ammunition Center and School (USADACS) was tasked by Lone Star Army Ammunition Plant (LSAAP), Texarkana, TX to provide MIL-STD-398 instrumentation services for measuring blast overpressure and thermal flux of the barricade for Volcano MOPMS Pressure Cartridge Assembly. The barricade shields operators form a quantity of explosive material used as a filter for the pressure cartridge. An maximum credible incident (MCI) was identified by LSAAP and approved by U.S. Army Materiel Command, Field Safety Activity (AMCFSA), Charlestown, IN. Based on this criteria, two blast pressure gages were placed at operator positions in front of and at the side of the barricade. Thermal flux gages were also placed at the same positions of the blast overpressure gages. The test charge was functioned, blast pressure and thermal flux recorded. Blast overpressure levels were too low in amplitude to be recorded. Thermal flux was recorded and radiation level was well below the exposure limits of MIL-STD-398.

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U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
Evaluation Division
Savanna, IL 61074-9639

REPORT NO. EVT 3-90

MIL-STD-398 EXPLOSIVE TEST

OF

BARRICADE FOR VOLCANO-MOPMS PRESSURE CARTRIDGE ASSEMBLY

TABLE OF CONTENTS

PART 1

INTRODUCTION

A. BACKGROUND.

The U.S. Army Defense Ammunition Center and School was tasked by LSAAP to provide MIL-STD-398 instrumentation services for measuring blast overpressure and thermal flux of the barricade for Volcano MOPMS Pressure Cartridge Assembly. The barricade shields operators form a quantity of explosive material used as a filter for the pressure cartridge. An MCI was identified by LSAAP and approved by AMCFSA, Charlestown, IN. Based on this criteria, two blast pressure gages were placed at operator positions in front of and at the side of the barricade. Thermal flux gages were also placed at the same positions of the blast overpressure gages. The test charge was functioned, blast pressure and thermal flux recorded. Blast overpressure levels were too low in amplitude to be recorded. Thermal flux was recorded and radiation level was well below the exposure limits of MIL-STD-398.

B. AUTHORITY.

This test was conducted in accordance with mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-6000. Reference is made to Change 4, 4 October 1974, to AR 740-1, 23 April 1971, Storage and Supply Operations; AMCCOMR 10-17, 13 January 1986, Mission and Major Functions of U.S. Army Defense Ammunition Center and School.

C. OBJECTIVE.

The objective of this test is to determine if the barricade for Volcano MOPMS Pressure Cartridge Assembly meets the requirements of

MIL-STD-398: Method 101, Blast Overpressure; Method 201, Fragment Retention; and Method 301, Heat Flux Measurement.

D. CONCLUSIONS.

1. Blast overpressures recorded at the operators position was 0.5 psi reflected pressure and 0.25 psi reflected at the left side of the shield. No direct blast overpressure was recorded. The blast pressures recorded are below the 5.0 psi limit for reflected pressure.

2. The barricade was not effective in eliminating fragmentation. Protective shield cover over the stack vent was blown approximately 100 feet from the barricade. In addition, unfunctioned M1 propellant grain was scattered on the ground at approximately 50 feet radius from the center of the barricade.

3. Thermal flux radiation recorded at the operators position was 0.1 btu/sq ft-sec. This amount of radiation is below the maximum limit of MIL-STD-398. Thermal flux observed at the side of the barricade was at the electronic threshold of the instrumentation. As a result of this low level, no usable data was recorded.

4. Blast overpressure and heat flux measurements indicate that the shield is effective in shielding the operator from an accidental functioning of the explosive in the barricade. The barricade was not effective in retaining fragmentation. The fragments were not part of the explosive device, but part of the protective shield and the explosive materiel.

E. RECOMMENDATION.

It is recommended that the barricade for Volcano MOPMS Pressure Cartridge Assembly be retested for Fragmentation Retention, Method 201, after a method has been devised to retain the shield protective cover.

PART 2

ATTENDEES

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PART 3

TEST PROCEDURES

DETAILED REQUIREMENTS

100 Class - Blast Attenuation Tests

200 Class - Fragmentation Confinement Tests

300 Class - Thermal Effects Attenuation Tests

CLASS-100 BLAST ATTENUATION TESTS

METHOD 101 BLAST OVERPRESSURE MEASUREMENT

A. PURPOSE

1. Measurement of blast overpressure is conducted to ensure that personnel are not exposed to peak positive incident overpressure greater than 2.3 psi when the operational shield is subjected to an MCI.

2. An acceptable alternative to measuring peak positive incident overpressure is to measure peak positive normal reflected overpressure. Personnel shall not be exposed to a maximum positive normal reflected overpressure greater than 5.0 psi when the operational shield is subjected to an MCI.

B. DESCRIPTION OF TEST

An MCI is created with the operational shield. Blast pressure gages are used to measure blast overpressure.

C. CRITERIA FOR PASSING TEST

The operational shield shall be considered acceptable if it can be determined from a pressure-distance plot of the data that personnel will not be exposed to a peak positive incident overpressure above 2.3 psi or a peak positive normal reflected overpressure above 5.0 psi.

D. INSTRUMENTATION

Blast Pressure Gages and Electronic Recording System. Based on the equivalent test charge weight of explosives and anticipated peak overpressure, the instrumentation system shall have the necessary response time and band width to acquire data. Instrumentation shall be calibrated in accordance with current procedures of TB 43-180, Calibration Requirements for the Maintenance of Army Materiel.

E. TEST PROCEDURE

1. When the shield is tested in a simulated operational bay environment, overpressure readings shall be taken at the following locations:

(a) At the center of probable head locations of each operator. For standing locations, the gages shall be positioned 65 inches above the floor; for sitting locations, it shall be 31.5 inches above the seat.

(b) At representative positions where transient personnel may be located.

2. When testing is conducted in open air, position blast gages around the shield in two or three concentric circles at distances where it is expected that overpressures of interest will be found. Stagger the gages so shock waves reaching the outer circles are not distorted by gages in the inner circle. The gages shall be placed at a height of 65 inches.

3. All instrumentation shall be within calibration at time of test.

4. If the shield is designed for use with more than one model or type of ammunition, select the item that would produce the maximum overpressure.

5. Apply an overload equal to 25 percent or more of the filler weight of the ammunition selected for the test, unless otherwise directed in an approved test plan.

6. All major explosive components should be fuzed separately to ensure simultaneous detonation or deflagration in order to simulate the MCI, unless otherwise directed in an approved test plan.

7. Function explosives and record overpressure readings.

8. Prepare pressure-distance plots from overpressure recordings.

CLASS-200 FRAGMENT RETENTION TESTS

METHOD 201 FRAGMENT RETENTION TEST

A. PURPOSE

Fragment testing is conducted to verify that a prototype operational shield will:

1. Contain all fragmentation or direct fragmentation away from areas requiring protection.

2. Prevent generation of secondary fragmentation within areas requiring protection.

3. Prevent movement, overturning, or structural deflections which could result in personal injury.

B. DESCRIPTION OF TEST

An MCI is created to test the operational shield.

C. CRITERIA FOR PASSING TEST

1. Contain all fragmentation or direct fragmentation away from areas requiring protection.

2. Prevent generation of secondary fragmentation within areas requiring protection.

3. Prevent movement, overturning, or structural deflections which could result in personal injury.

D. TEST EQUIPMENT

Still picture camera equipment.

E. TEST PROCEDURE

1. Fragmentation Retention Test.

(a) If the shield is designed for use with more than one mode or type of ammunition, select that item which will have the greatest potential fragmentation or shape charge effect. Equipment, or reasonable simulation thereof, which shall perform the intended function on the ammunition, shall be

positioned to generate secondary fragments.

(b) Apply an overload equal to 25 percent or more of the filler weight of the ammunition selected for the test, unless otherwise directed in an approved test plan.

(c) All major explosive components should be fuzed separately to ensure simultaneous detonation or deflagration in order to simulate the MCI, unless otherwise directed in the approved test plan.

(d) Function explosives.

2. Post-Test Procedure.

(a) Examine the interior and exterior for evidence of fragments. Photograph the shield to document test results.

(b) Examine shield for movement, overturning, or structural deflections which could result in personal injury.

(c) Shields designed for intentional detonation shall be examined for damage and an estimate made as to the ability of the shield to remain operational as specified in the design criteria.

CLASS-300 THERMAL EFFECTS MEASUREMENT

METHOD 301 HEAT FLUX MEASUREMENT

A. PURPOSE

Heat flux measurement is a condition of measure that personnel are not exposed to a maximum radiant heat flux determined in the equation given in criteria for passing test of this standard.

B. DESCRIPTION OF TEST

An MCI is created. Heat flux transducers are used to measure radiant heat flux.

C. CRITERIA FOR PASSING TEST

The operational shield shall be considered acceptable if it can be determined from heat flux-distance and heat flux-time plots of test data that personnel will not be exposed to a radiant heat flux rating exceeding the formula: F=1.0/(0.62t) T=0.7423 cal/cm2-sec, where F=is the thermal flux, T=time in seconds.

D. INSTRUMENTATION

Heat Flux Transducers and Electronic Recording System. Based on the thermal flux expected at the location of the transducers, the instrumentation system shall have the necessary response time and bandwidth to acquire data. Instrumentation shall be calibrated in accordance with current procedures of TB 43-180, Calibration Requirements for the Maintenance of Army Materiel.

E. TEST PROCEDURE

1. When the shield is tested in a simulated operational bay environment, heat flux readings shall be taken at the following locations:

(a) At the center of probable head locations of each operator. For standing locations the transducers shall be positioned 65 inches above the floor; for sitting locations it shall be 31.5 inches above the seat.

(b) At representative positions where transient personnel may be

located.

2. In a free field test, flux values at various distances from the point of detonation can be estimated by the relationship: O1*(d1**2)=O2*(d2**2), where O=heat flux in btu/in^2-sec d=distance from point of detonation.

3. All instrumentation shall be within calibration at time of test.

4. If the shield is designed for use with more than one model or type of ammunition, select the item for the greatest heat flux.

5. Apply an overload equal to 25 percent or more of the filler weight of the ammunition selected for the test, unless otherwise directed in an approved test plan.

6. All major explosive components should be fuzed separately to ensure simultaneous detonation of deflagration in order to simulate the MCI, unless otherwise directed in an approved test plan.

7. Function explosives and record radiant flux readings.

8. Prepare heat flux-distance and heat flux-time plots from radiant flux recordings

PART 4

LSAAP TEST PROCEDURE

TECHNICAL PROGRAM LS-319

SUBJECT: Testing of proposed barricade for powder dispensing for pressure cartridge for Volcano-MOPMS, SKC-2515.

PURPOSE: To determine if the proposed dual purpose barricade will adequately contain the explosion of (1.) 10 ounces of Black Powder Class 4, SPEC MIL-P-223 & (2.) 30 ounces of Propellant, Ml Type 1. (Equivalent to a normal charge weight plus + 25% safety factor.)

DISCUSSION:

The proposed barricade will be utilized to enclose dispense mechanisms for the Black Powder and Propellant required in producing the pressure cartridges for Volcano & MOPMS. In order to provide fragmentation data during the test an item similar in construction to the powder dispense units will contain the explosives.

PROCEDURE:

The barricade will be positioned at a suitable location in XX-17 near test barricade XX-76.

An electric blasting cap will be placed inside the barricade with the lead wires run to the outside. If necessary, a pair of supplemental lead wires will be attached to the wires of the blasting cap and shunted.

An exact weight of 10 ounces of Black Powder, Class 4 will be received from Stores and positioned inside the barricade adjacent to the blasting cap and powder dispense simulator. An exact weight of 30 ounces of Ml Type 1 Propellant will be received from Stores and positioned inside the barricade adjacent to the blasting cap and powder dispense simulator. The barricade door will then be closed.

The field lines will be shunted at the connector box and checked at the barricade end for continuity and extraneous electricity. If the circuit is complete and no extraneous electricity is detected, the lead wires and field line will be connected.

The circuit will be checked at the connector box. If no deficiencies exist in the circuit, the Technical Supervisor will ascertain that all persons are in their proper locations. The blasting machine will then be introduced to the circuit and activated.

SAFETY REQUIREMENTS:

All electrical connections will be taped to insure adequate insulation.

The circuit connector box and the blasting machine will be locked at all times except when firing. The key will be in the possession of the Technical Supervisor.

PERSONNEL LIMITS: Eight (8)

NOTE: Still and Fastex pictures will be made of the ECD and explosion. Day & Zimmermann and COR Safety Offices will be notified prior to test.

Standing Order #63 will be followed in event of unusual occurance.

COORDINATOR:

HAL FEASEL, DICK KING
Technical Specialists

APPROVED BY:

RONALD E. SINQUEFIELD
Director, Technical
Services Division

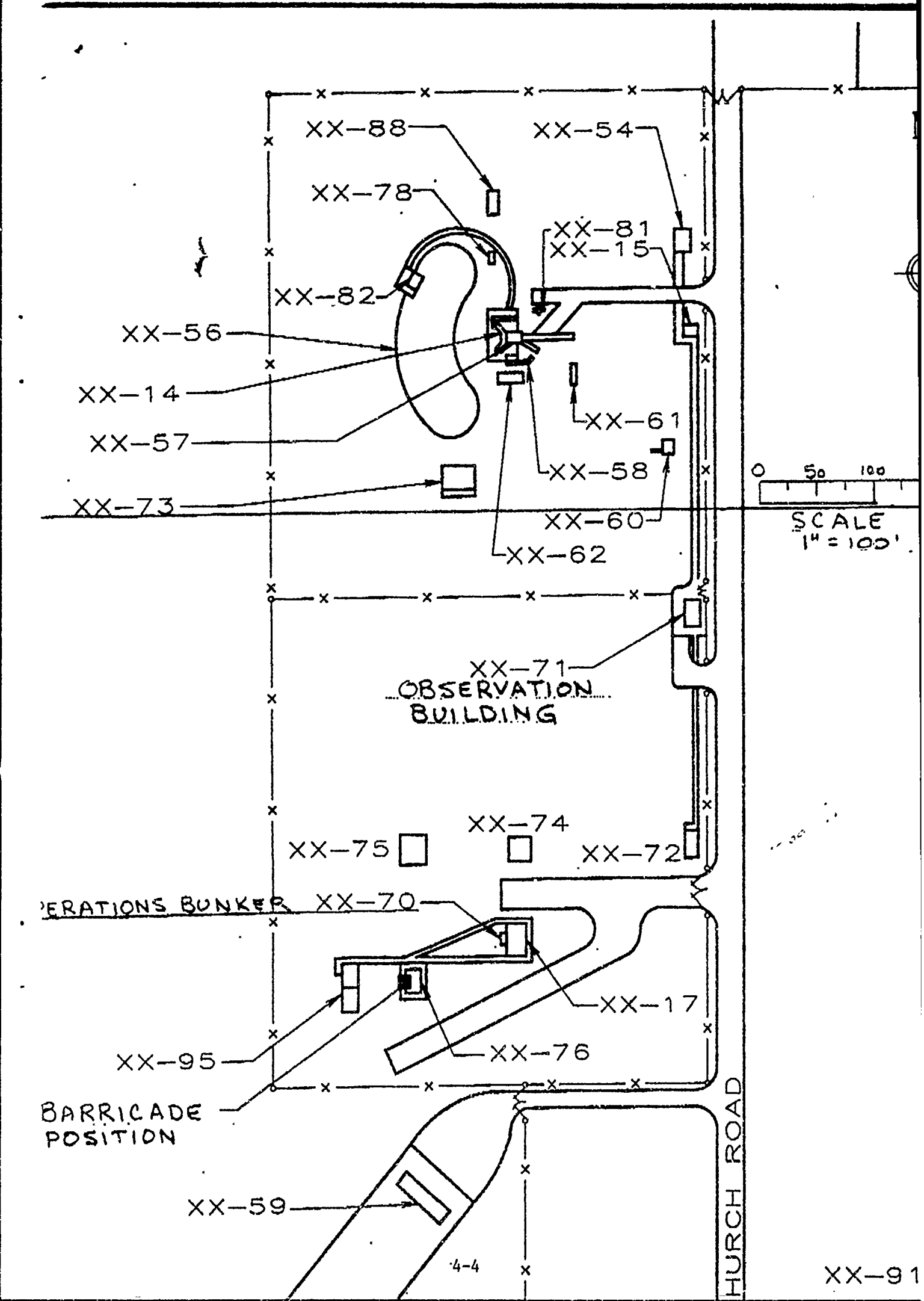
CONCURRENCES:

PHILLIP T. HALTOM
Director, Safety &
Industrial Engineering
Division

Carl J. Evans
Director, Operations Division

JOE B. RAFFAELLI, JR.
General Manager

DON BARCLAY
Chief, Safety Office
Contracting Officer's Representative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XX-60
XX-62
0 50 100
SCALE
1" = 100'
XX-71
OBSERVATION
BUILDING
XX-74
XX-75
XX-72
ERATIONS BUNKER
XX-70
XX-17
XX-76
XX-95
BARRICADE
POSITION
XX-59
HURCH ROAD
XX-91

AMXOS-SE (SMCLS-SF/19 Dec 88) (385-10d) 6th End Ms. Kessler/md/AV 366-7825
SUBJECT: Test Plans for LS-318 and LS-319 Technical Programs

USAMC Field Safety Activity, Charlestown, IN 47111-9669 25 Oct 89

For Commander, U.S. Army Armament, Munitions and Chemical Command,
ATTN: AMSMC-SFP, Rock Island, IL 61299-6000

1. We have reviewed the subject submission from an explosives safety viewpoint. Based on the information provided, we are returning the test results without approval.

2. As stated in the 2nd endorsement, DOD 6055.9-STD requires that personnel exposed to remotely controlled operations will not be exposed to blast overpressures greater than 2.3 psi. MIL-STD-398 provides information on test instrumentation for blast overpressure measurement, test procedures, and criteria for passing. These procedures were not followed and no measurement of the blast overpressure was made.

3. DOD 6055.9 also states that personnel shall be provided protection that will limit thermal fluxes to 0.3 calories per square centimeter per second. MIL-STD-398 also provides procedures and criteria for this requirement. These procedures were not followed and no measurement of the thermal fluxes was made.

4. Operational shields must provide the protection listed above and this must be shown by testing and measurement of the blast overpressure and thermal fluxes. The test data provided verify that no fragments escaped the containment device, but smoke did seep out around the door. Total containment of the blast was not provided so remote operator protection must be shown.

3 Encls
1-2. wd (previous endorsements)
3. nc (2 cys)

C. J. CAMPBELL
Director

CF (wo/encls):
Cdr, LSAAP (SMCLS-SF)

AMXOS-SE (SMCLS-SF/19 Dec 88) (385-10d) 2nd End Ms. Kessler/eb/AV 366-7825
SUBJECT: Test Plans for LS-318 and LS-319 Technical Programs

USAMC Field Safety Activity, Charlestown, IN 47111-9669 8 Mar 89

For Commander, U.S. Army Armament, Munitions and Chemical Command,
ATTN: AMSMC-SFP, Rock Island, IL 61299-6000

We have reviewed the subject test plans from an explosives safety viewpoint. Based on the information provided, the test plans are approved with the following conditions:

a. DOD 6055.9-STD, Chapter 2, paragraph D.3., states that the personnel exposed to remotely controlled operations will not be exposed to blast overpressures greater than 2.3 psi. The proposed explosive containment device should be designed to ensure that the operators will not be exposed to greater than 2.3 psi. MIL-STD-398 provides information on test instrumentation for blast overpressure measurement, test procedures, and criteria for passing. Testing should be performed in accordance with prescribed procedures to insure that requirements for remote operator protection are met.

b. MIL-STD-398 also provides test procedures to insure fragment retention. Insure that proper test procedures and post-test procedures are followed to show total containment of fragments.

c. DOD 6055.9, Chapter 2, paragraph P.2., states that personnel shall be provided protection that will limit thermal fluxes to 0.3 calories per square centimeter per second. MIL-STD-398 also provides procedures and criteria for this requirement.

FOR THE DIRECTOR:

Encl
wd

WILLIAM P. XUTMEYER
Chief, Safety Engineering Division

CF:
Cdr, LSAAP (SMCLS-SF)

PART 5

TEST RESULTS

SUBJECT: Explosive Test of barricade for Volcano MOPMS Pressure Cartridge Assembly

TEST DATE: 6 November 1989

TEST LOCATION: Lone Star Army Ammunition Plant

TEST RESULTS:

1. Blast Overpressure, Method 101:

   a. At operators position: 0.5 psi, reflected

   b. At left side of barricade 0.25 psi, reflected

2. Fragment Retention Test, Method 201:

   a. The barricade did not contain fragmentation due to blowing of a protective cover approximately 100 feet from the barricade.

   b. M1 propellant grain was found on the ground approximately 50 feet from the barricade center line.

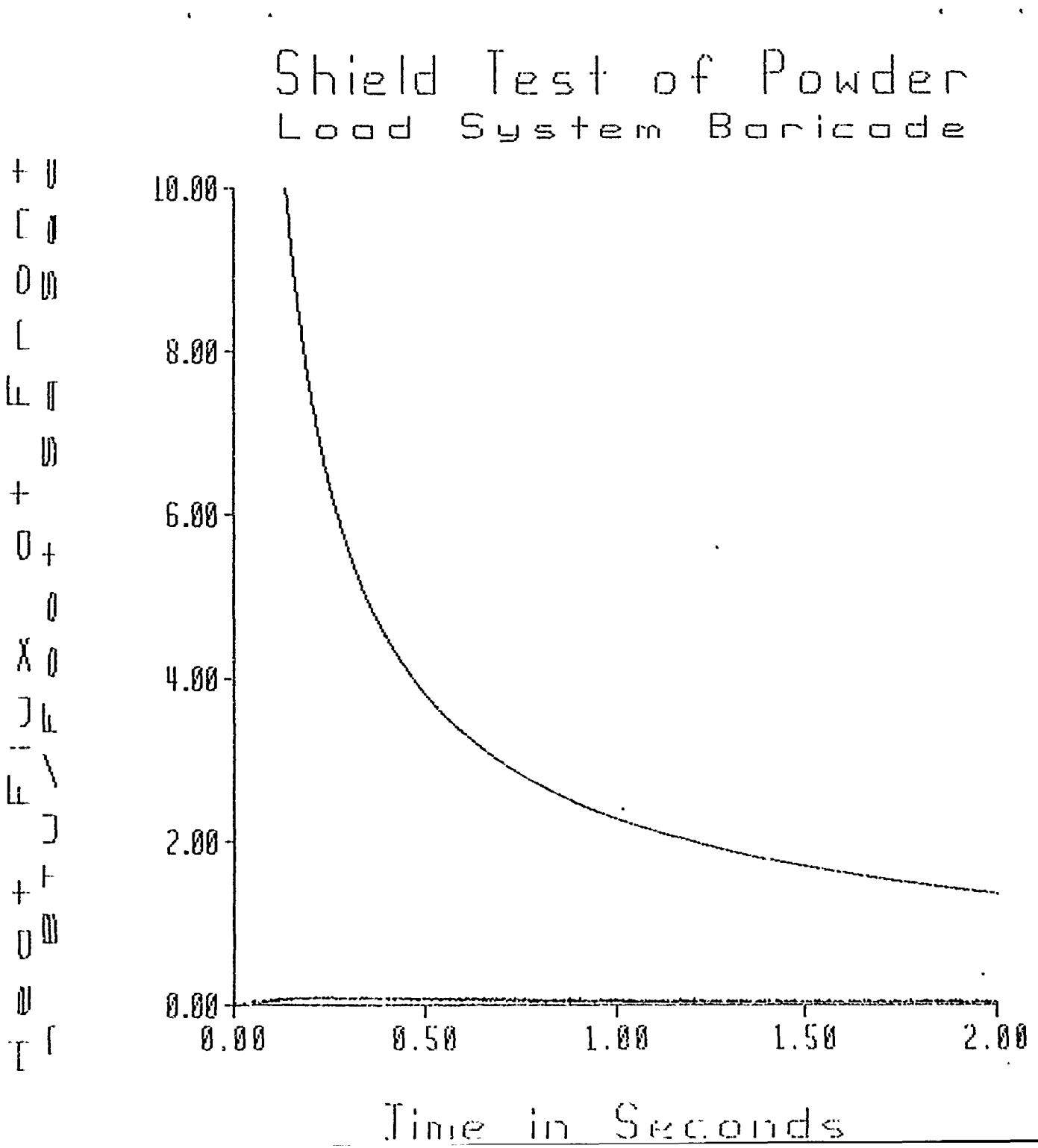
3. Heat Flux Measurements, Method 301:

   a. At operator's position: 0.1 btu/sq. ft.-sec.

   b. At left side of barricade: none recorded.

Note: Recorded blast pressures are reflected. No incident blast peak pressure was recorded.

A. C. McIntosh
General Engineer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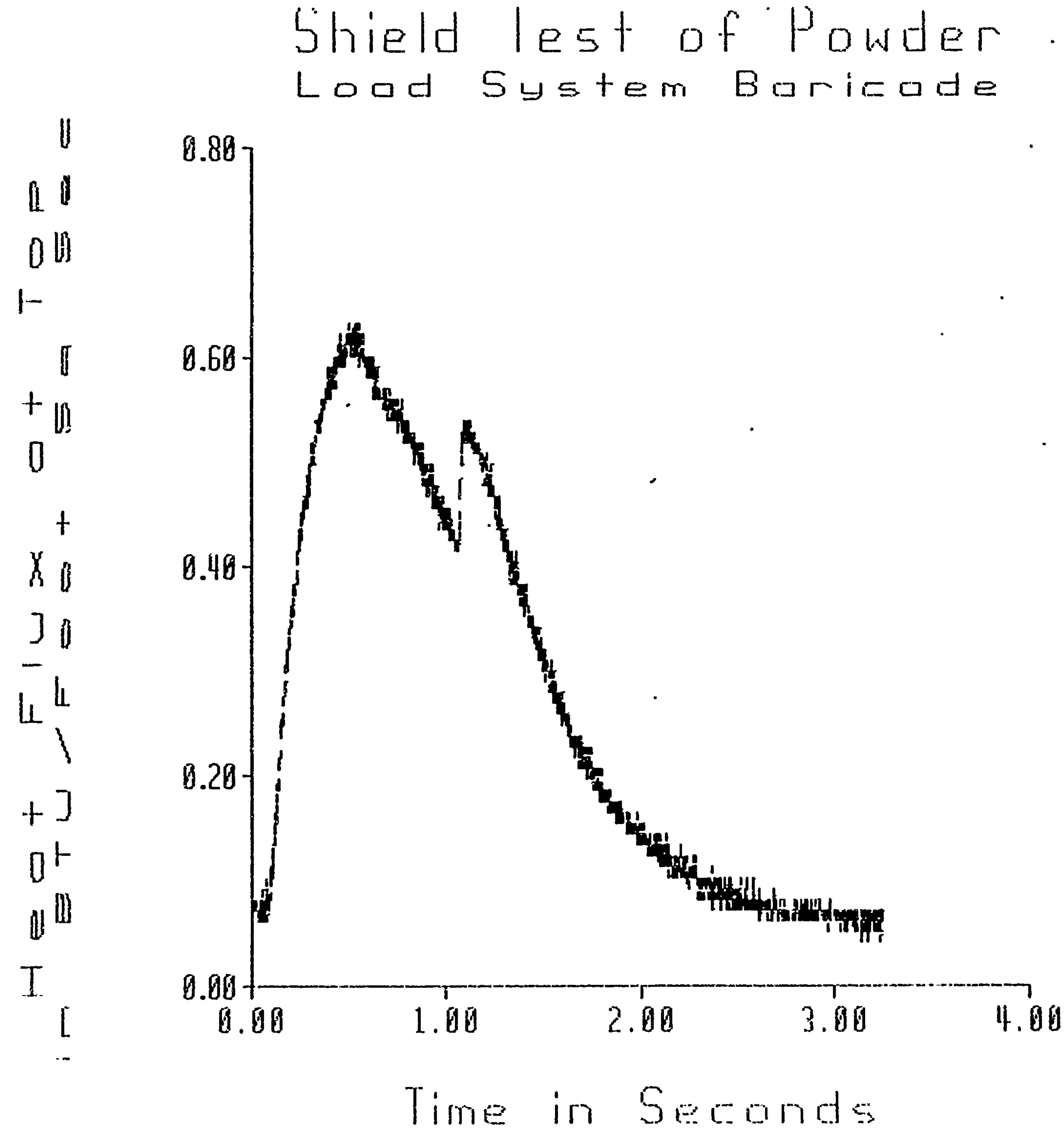
1.50
2.00
Time in Seconds



Shield Test of Powder
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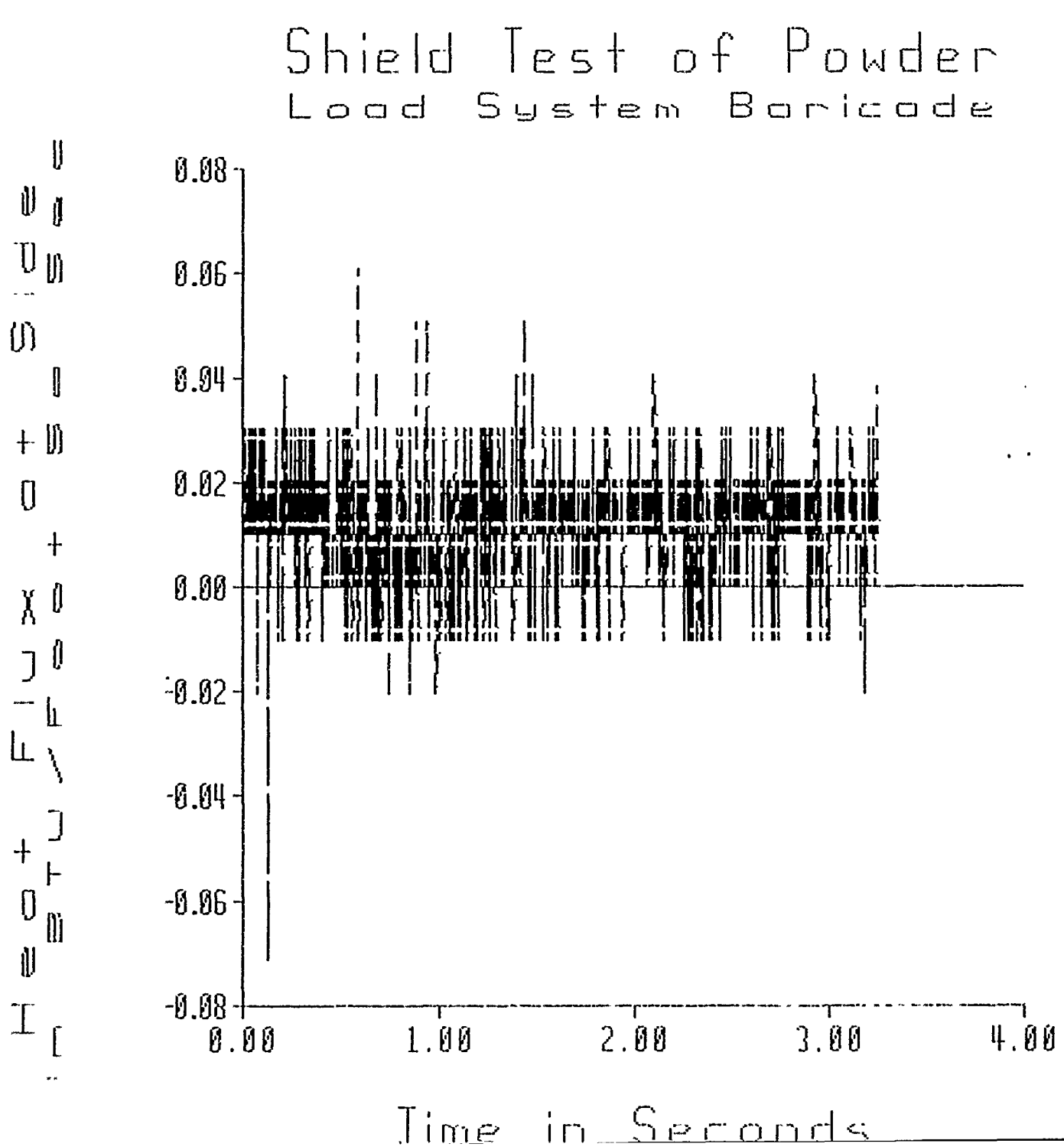
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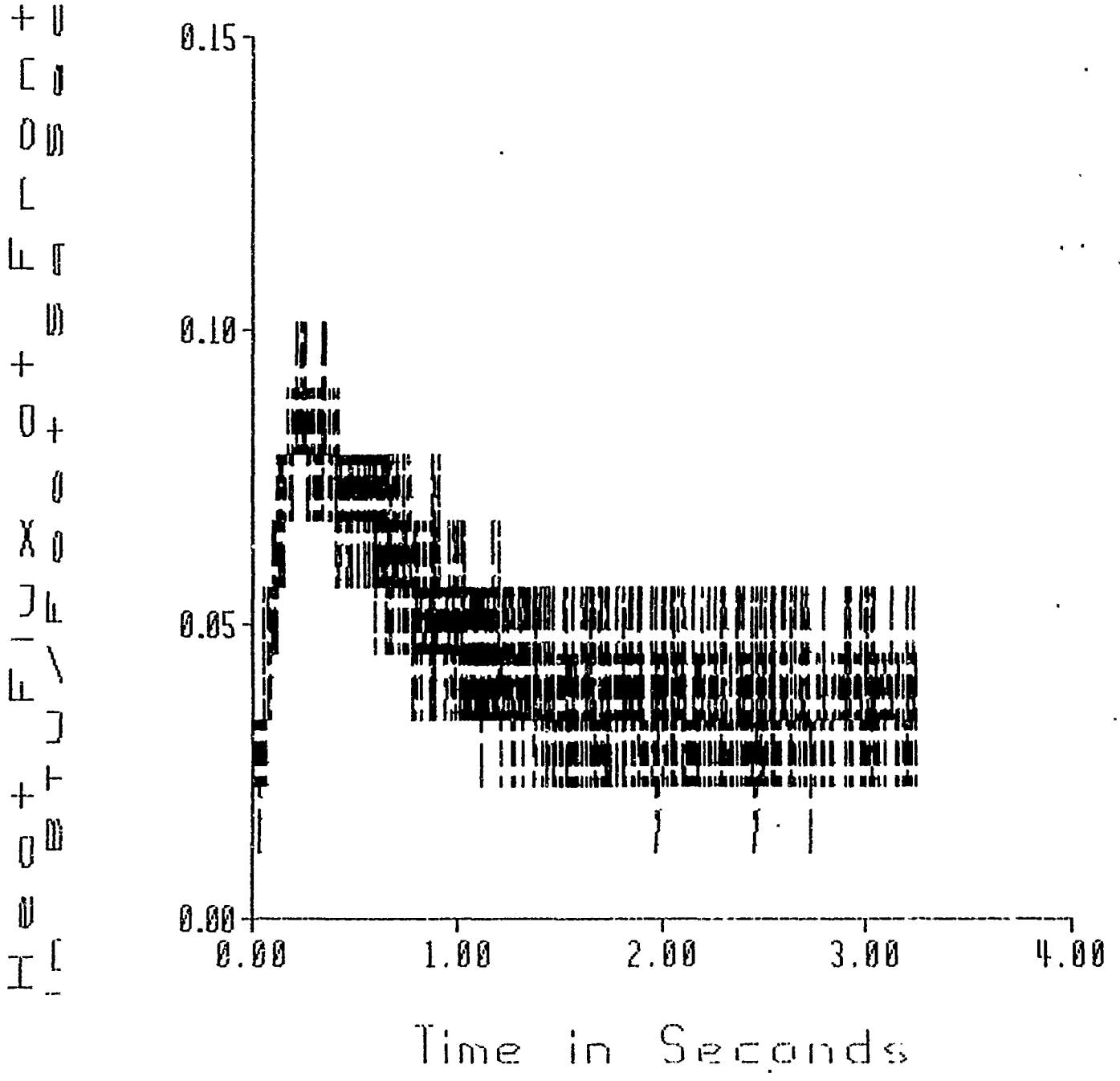
4.00
Time in Seconds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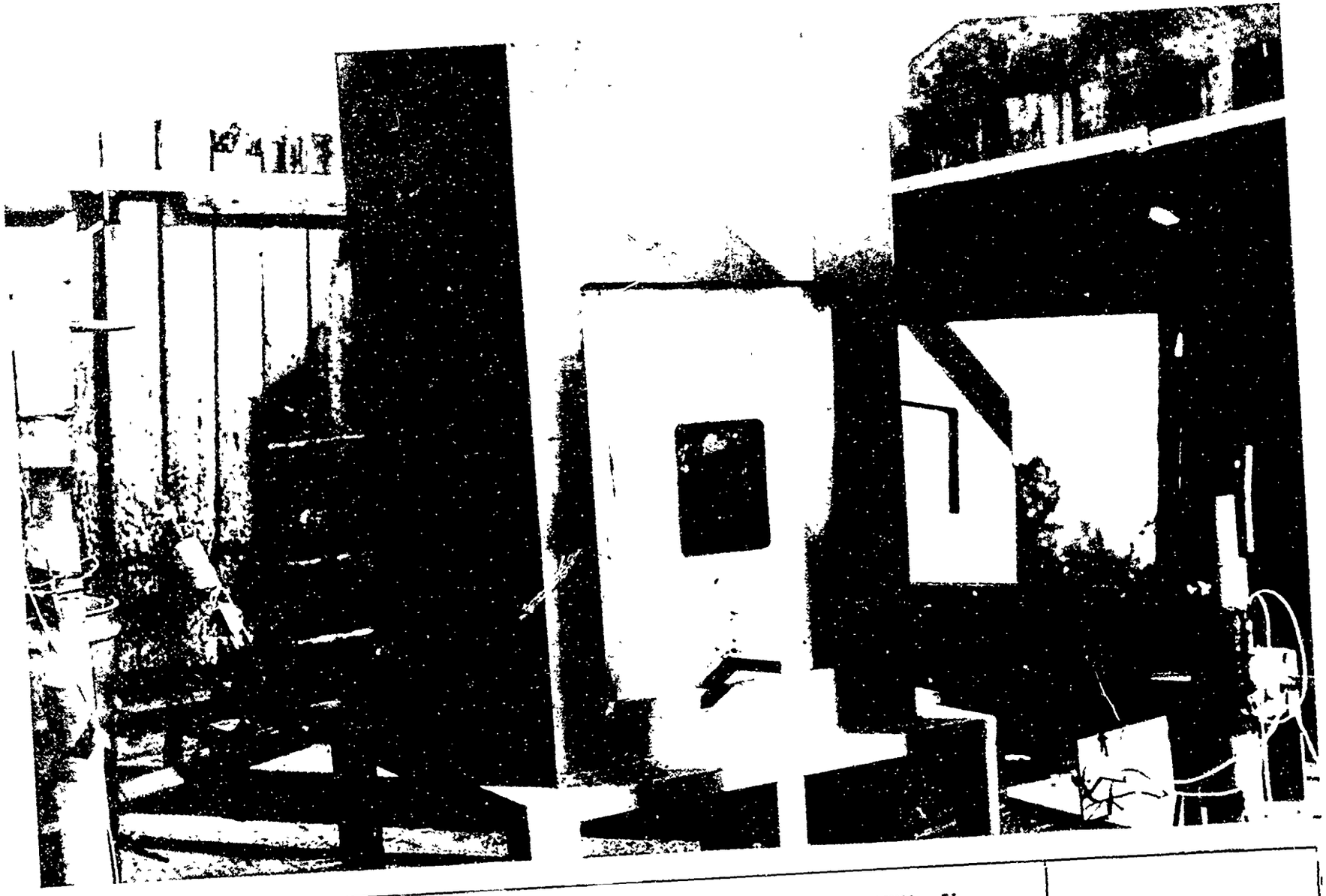
4.00
Time in Seconds

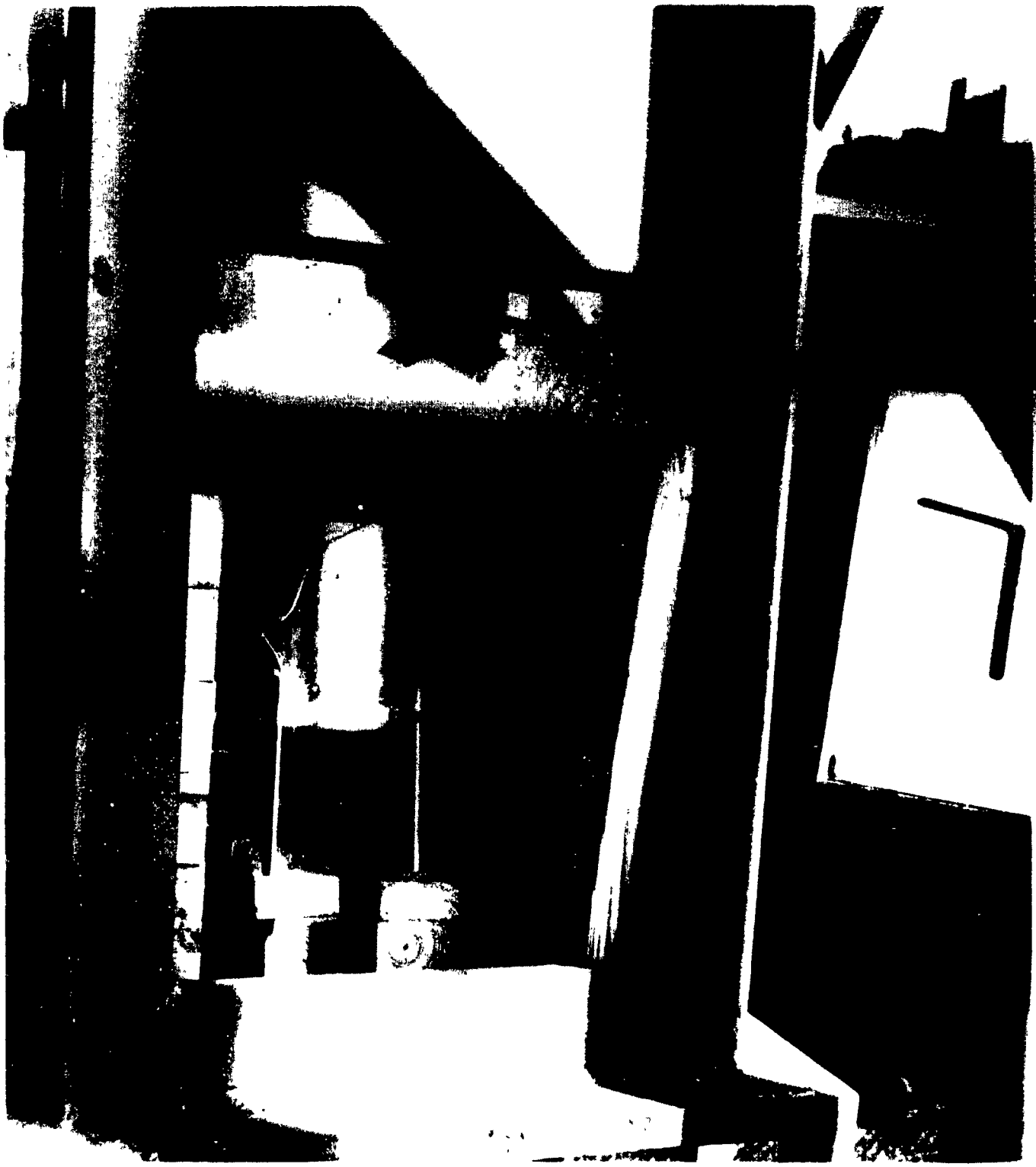
PART 6

PHOTOGRAPHS



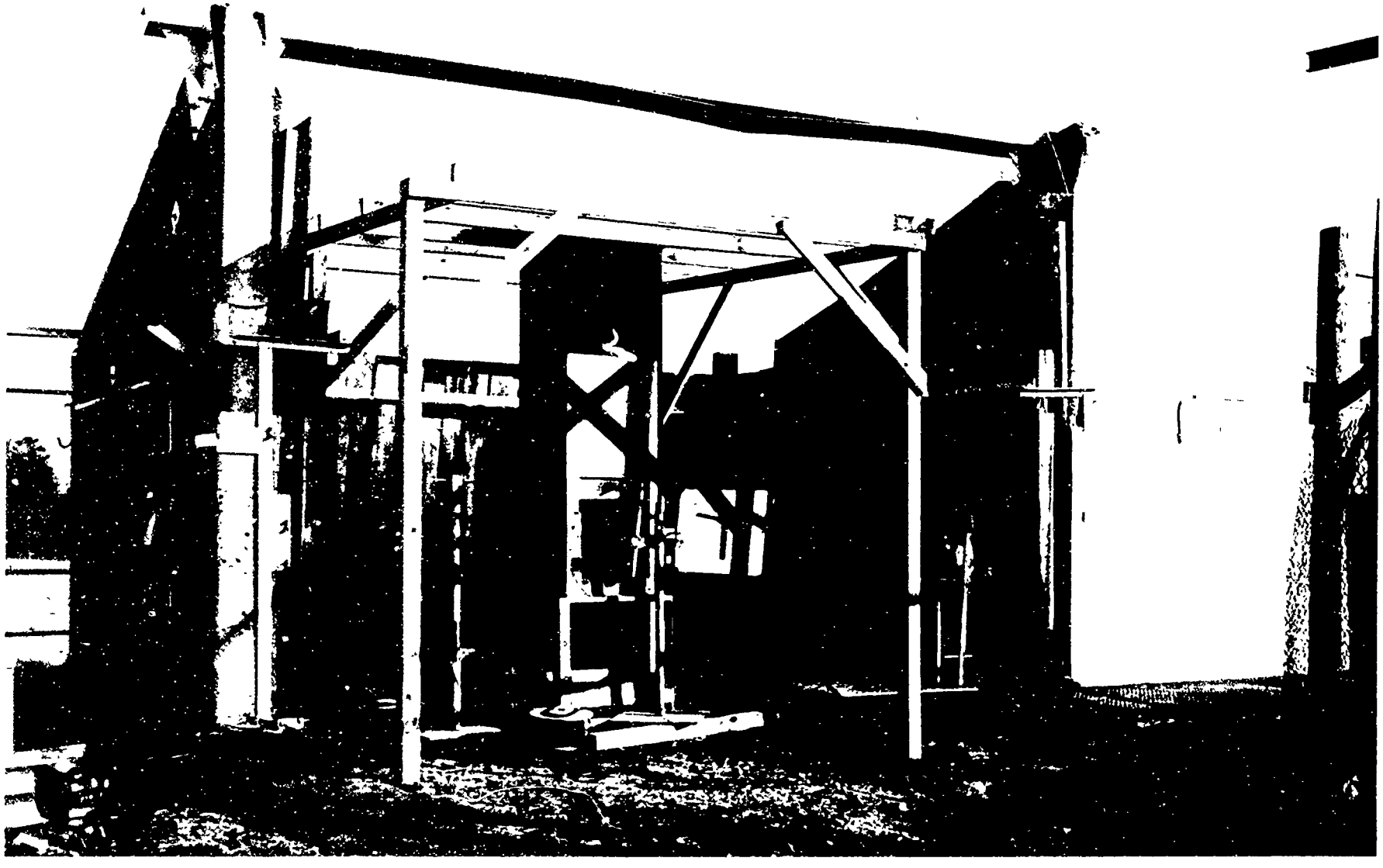
11-173-443H AMC 89	DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA, IL	

Photo No. 1 This photo shows the Volcano Pressure Cartridge loading barricade closed as in operation. Normally, mechanical cylinders would be attached to open and close the shield door. They have been removed for test purposes. The transducer stand at the right is at the operating position. The transducer stand at the left represents a possible transient operator position.



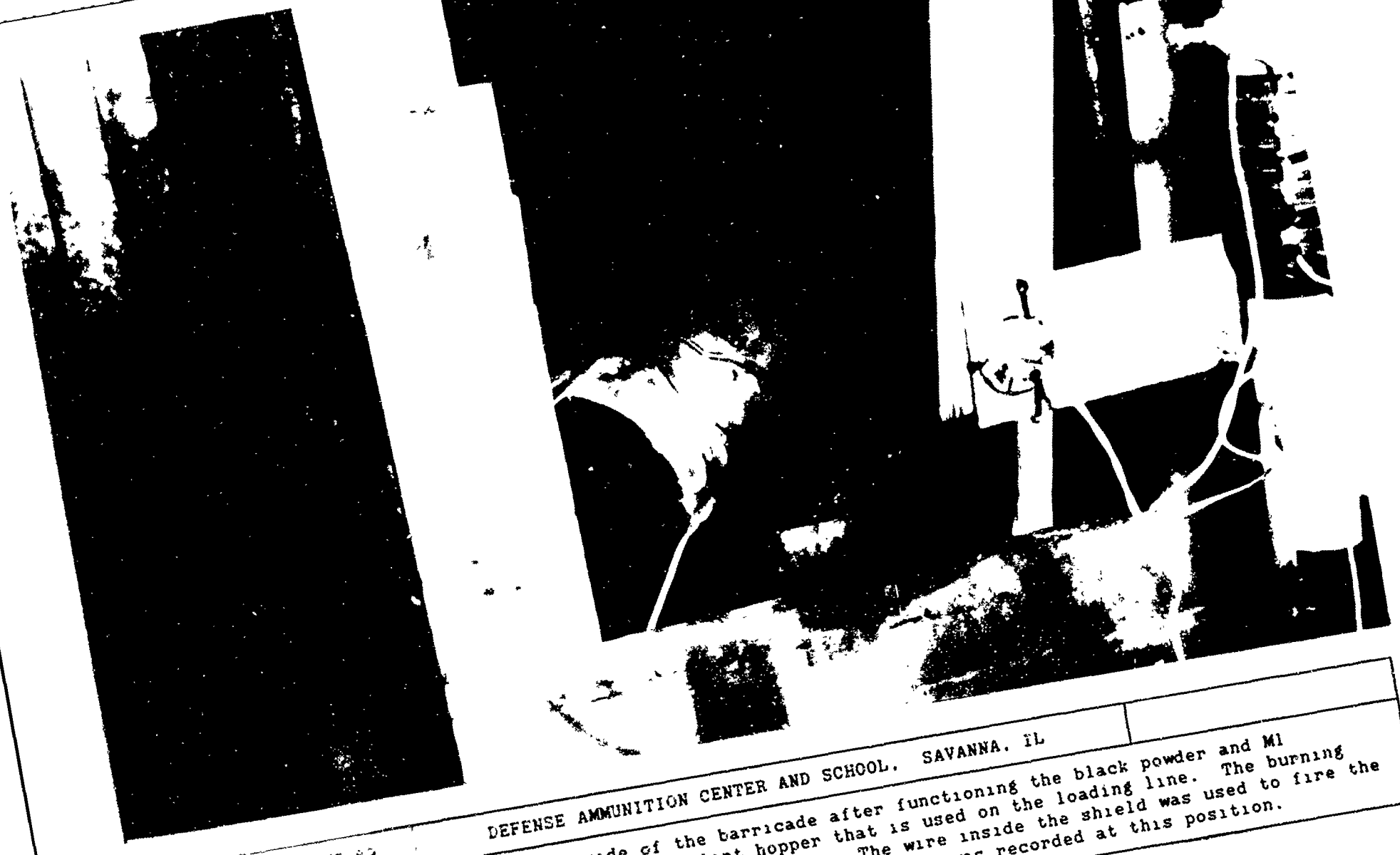
.. 173-4431 AMC 89	DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA, IL	

Photo No. 2 This photo shows a model of the Pressure Cartridge Filler Assembly containing black powder, M1 Propellant, and electric initiating device. This container is raised to the normal operating position with wood blocks. Normally, nonflammable materials will be used. The metal blocks and wood 2 by 4s are used to keep the loading shield open while the filter assembly is loaded.



11-173-443G AMC 89	DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA, IL	

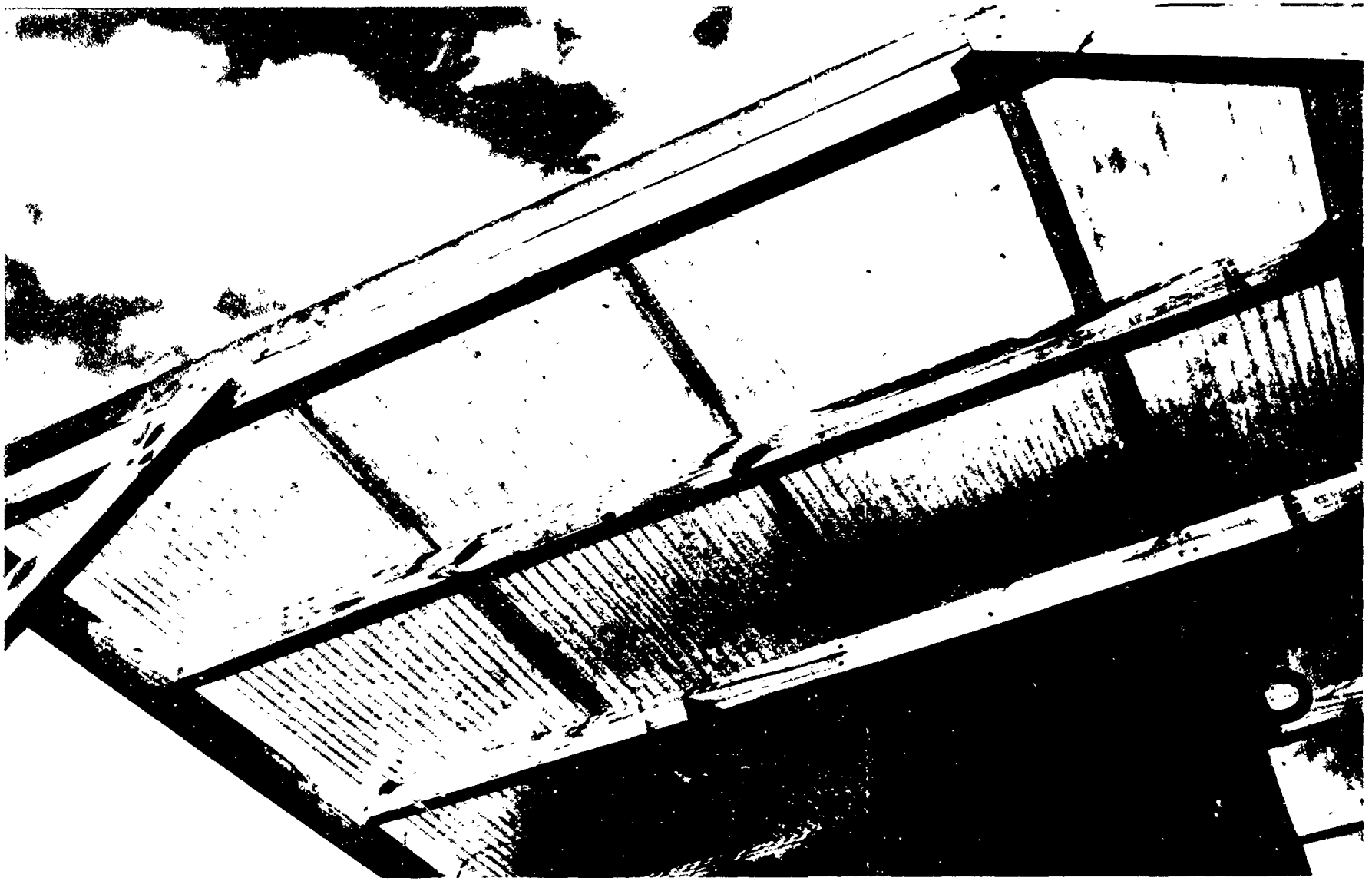
Photo No. 3 This photo shows an overall view of the test-site. The barricade to be tested is shown in the center. A model roof was constructed to simulate the roof where the barricade is expected to be used. blast overpressure and thermal flux gages are positioned at the operators position and at the left side.



DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA, IL

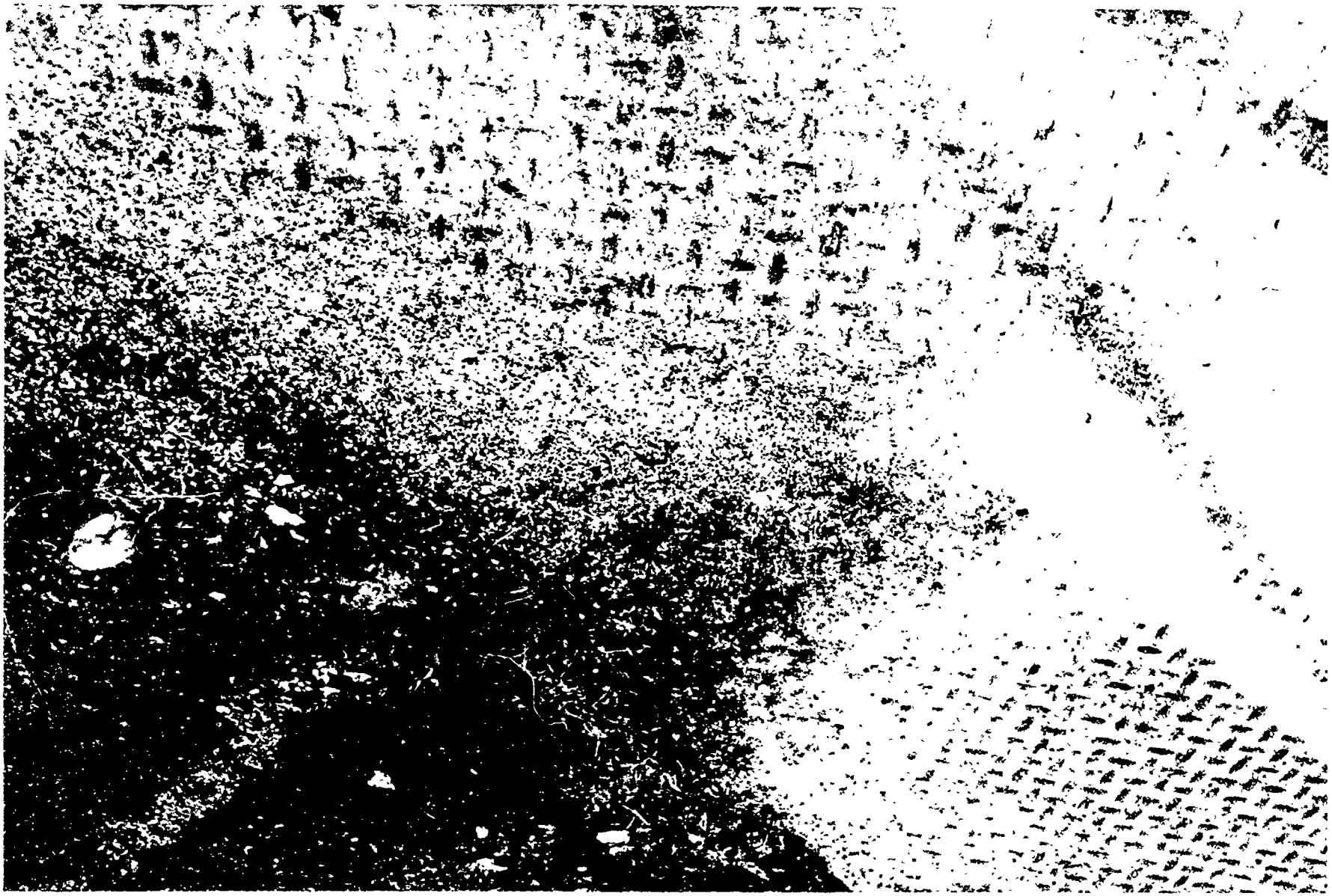
TT-4470 AMC 69

Test No. 4 This photo shows the inside of the barricade after functioning the black powder and MI
[illegible] The can represents a propellant hopper that is used on the loading line. The burning
[illegible] caused separation of the bottom from the sides. The wire inside the shield was used to fire the
[illegible] Minimal thermal flux and no blast overpressure was recorded at this position.



11-173-443K AMC 89	DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA. IL	

Photo No. 5 This photo shows the barricade projecting through the model roof. The covering is translucent plastic panels. Note the black specks resting on top of the panels. These specks are M1 propellant grains. The propellant grains were blown from the hopper at the operator's position inside the closed shield.

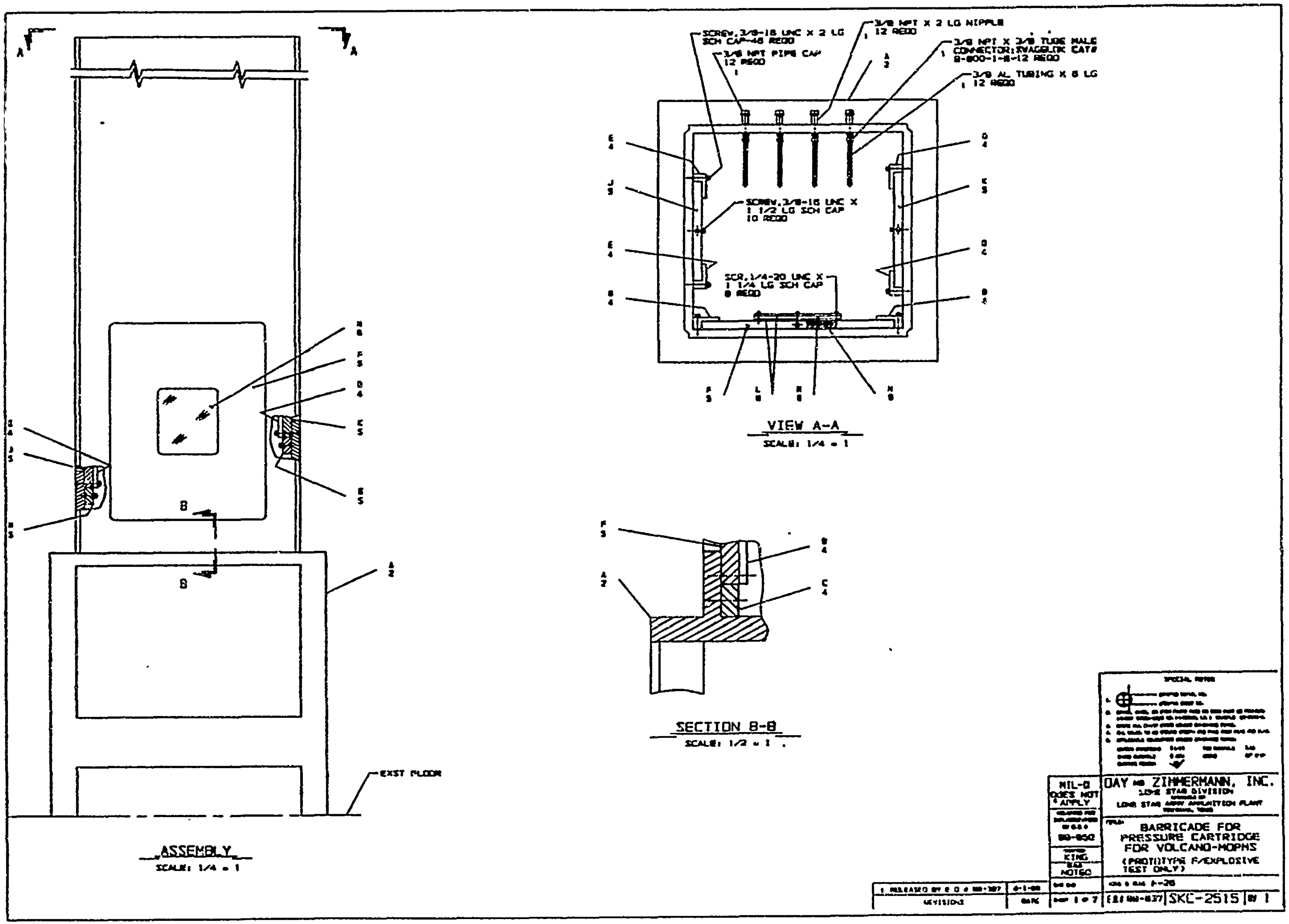


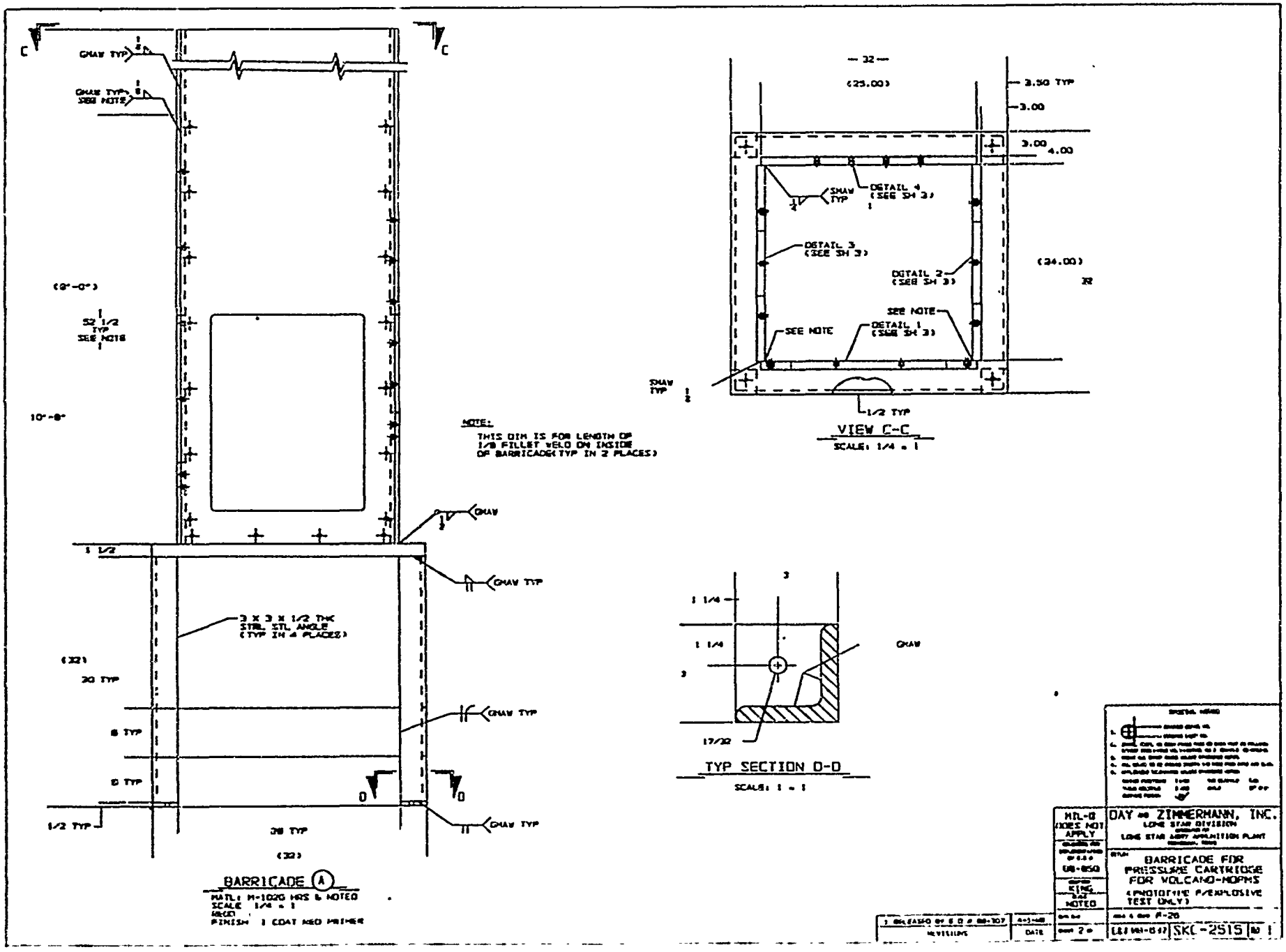
11-173-443L AMC 89	DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA, IL	

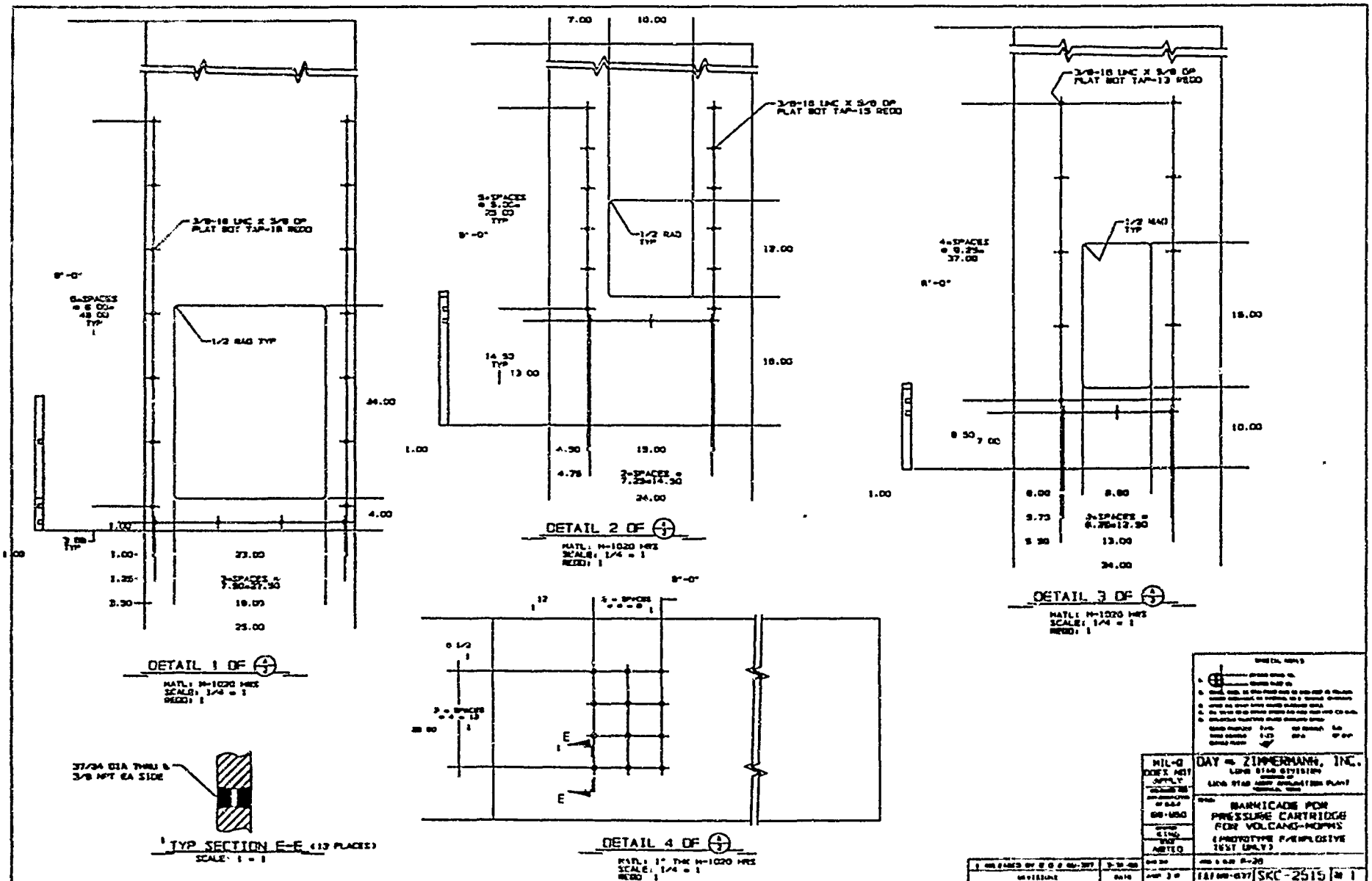
Photo No. 6 This photo shows M1 propellant grains on the ground after functioning the charge in the barricade. Propellant grains were found within a radius of 20 yards from the center of initiation.

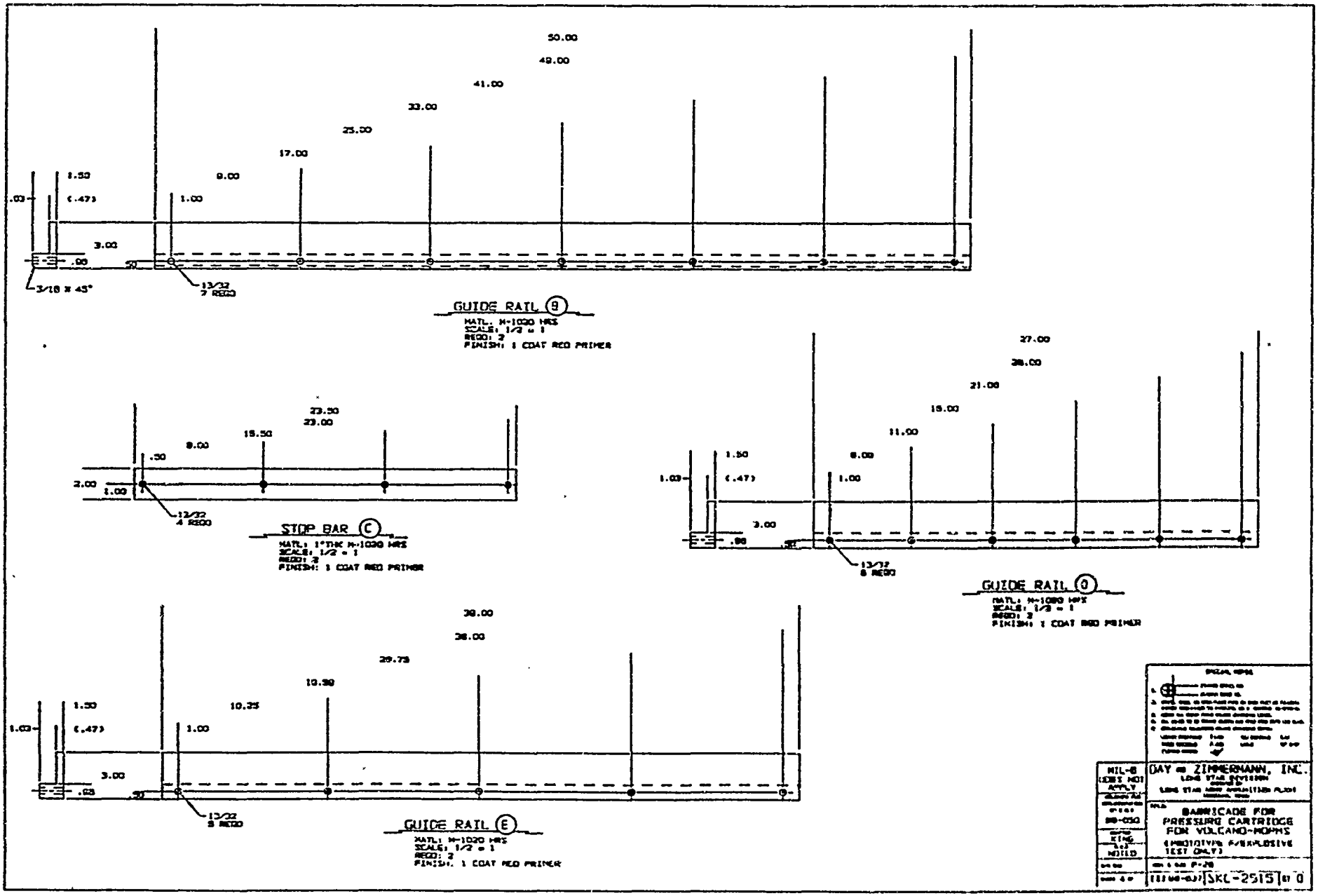
PART 7

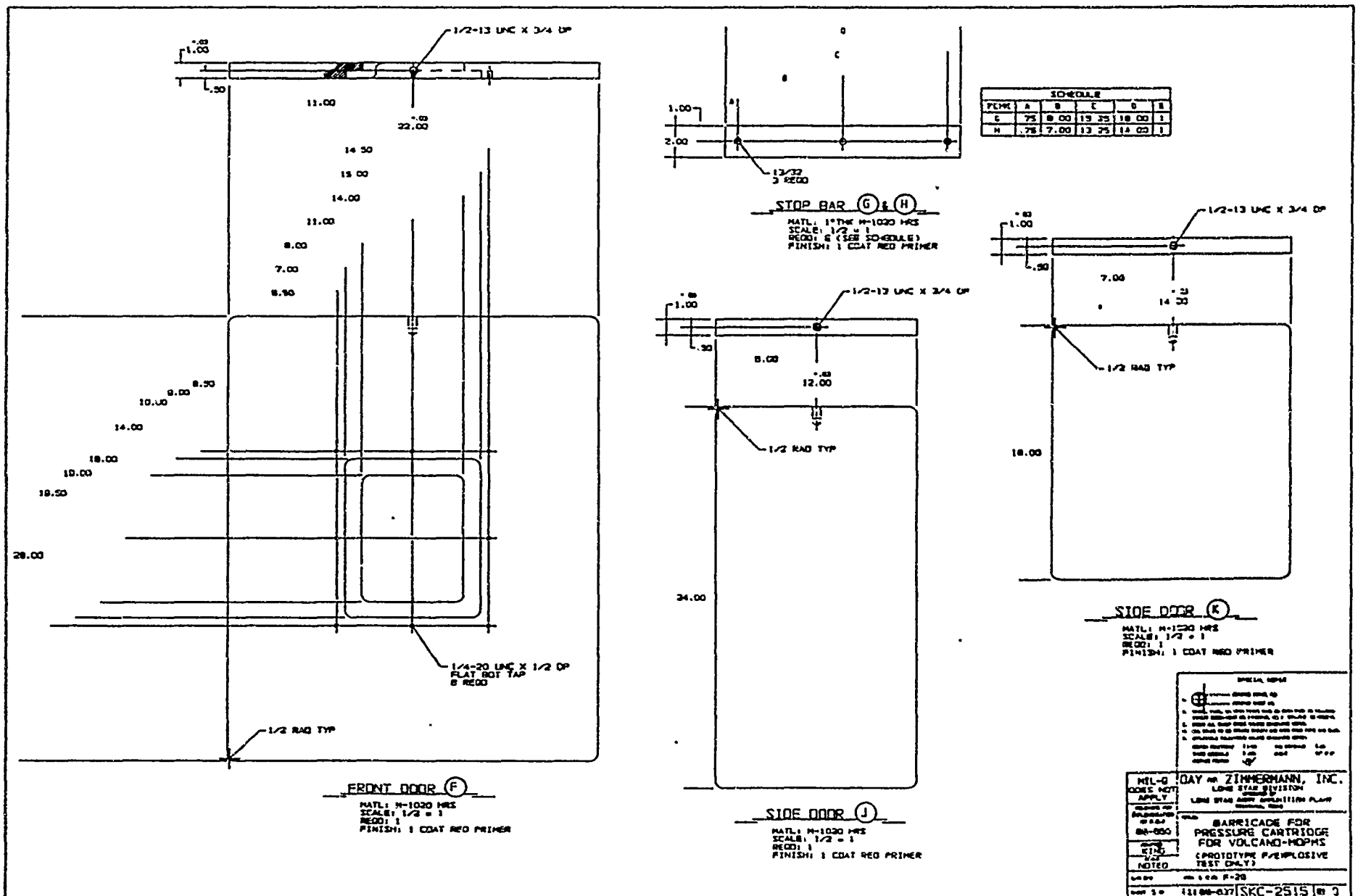
DRAWINGS

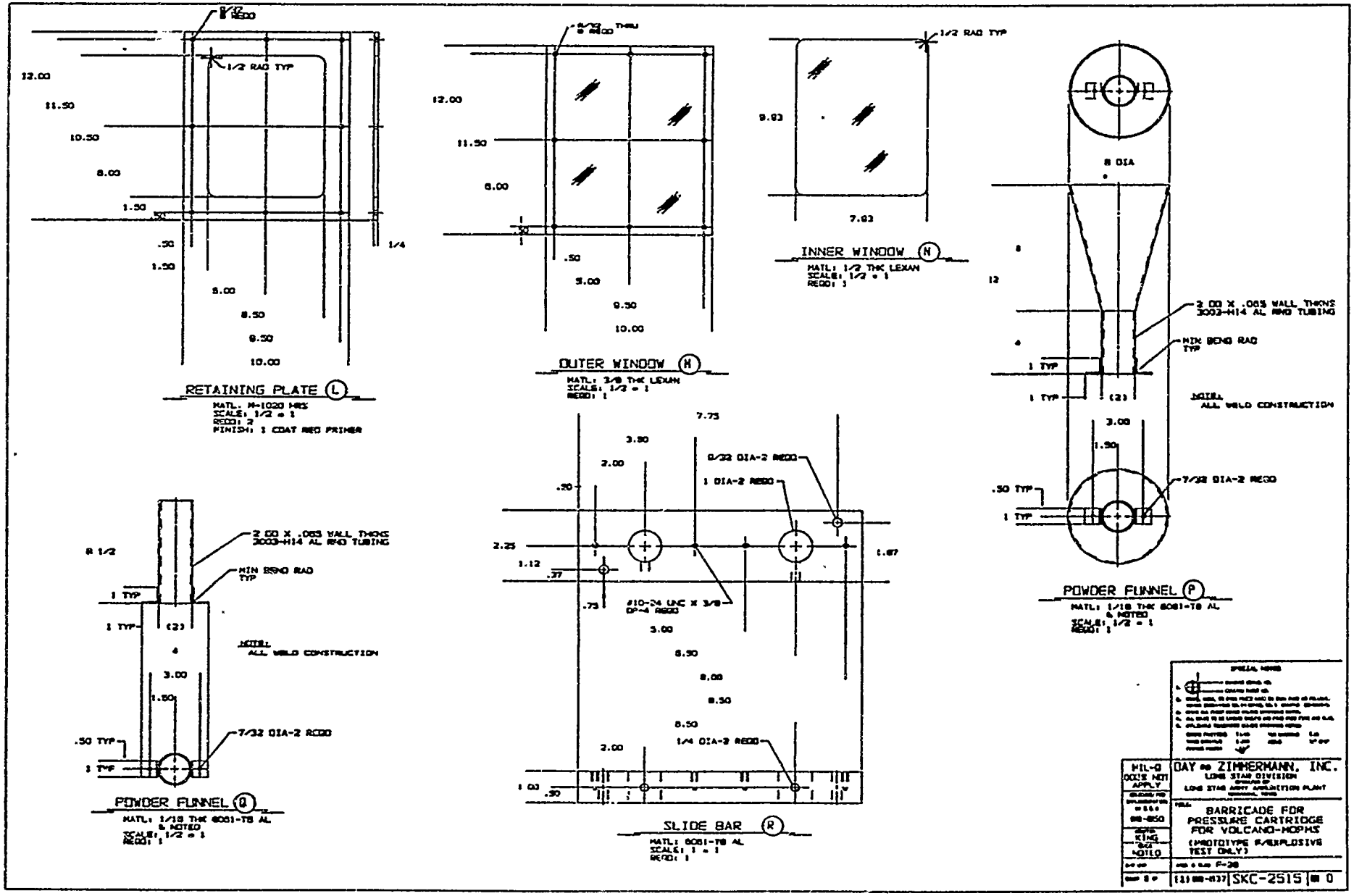

SCREW, 3/8-16 UNC X 2 LG SCH CAP-48 REQD
3/8 NPT PIPE CAP 12 REQD
3/8 NPT X 2 LG NIPPLE 12 REQD
3/8 NPT X 3/8 TUBE MALE CONNECTOR: SWAGELOK CAT# B-600-1-6-12 REQD
3/8 AL TUBING X 6 LG 12 REQD
SCREW, 3/8-16 UNC X 1 1/2 LG SCH CAP 10 REQD
SCR, 1/4-20 UNC X 1 1/4 LG SCH CAP 8 REQD
VIEW A-A
SCALE: 1/4 = 1
SECTION B-B
SCALE: 1/2 = 1
ASSEMBLY
SCALE: 1/4 = 1
EXST FLOOR
MIL-D DOES NOT APPLY
DAY AND ZIMMERMANN, INC.
LONE STAR DIVISION
LONE STAR ARMY AMMUNITION PLANT
BARRICADE FOR PRESSURE CARTRIDGE FOR VOLCANO-MOPMS
(PROTOTYPE F/EXPLOSIVE TEST ONLY)
KING
NOTGD
SKC-2515
SPECIAL NOTES

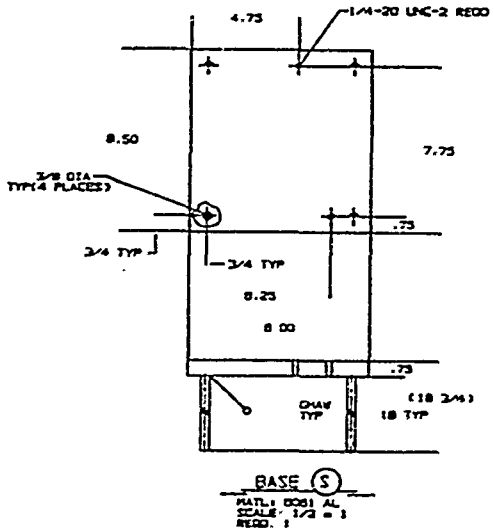

C
C
GMAW TYP
GMAW TYP SEE NOTE
(9'-0")
52 1/2 TYP SEE NOTE
10'-8"
GMAW
GMAW TYP
1 1/2
3 X 3 X 1/2 THK STRL STL ANGLE (TYP IN 4 PLACES)
(32)
20 TYP
8 TYP
8 TYP
D
D
1/2 TYP
38 TYP
(32)
GMAW TYP
GMAW TYP
BARRICADE (A)
MATL: M-1020 HRS & NOTED
SCALE 1/4 = 1
FINISH 1 COAT MED PRIMER
NOTE:
THIS DIM IS FOR LENGTH OF 1/8 FILLET WELD ON INSIDE OF BARRICADE (TYP IN 2 PLACES)
32
(25.00)
3.50 TYP
3.00
3.00
4.00
GMAW TYP
DETAIL 4 (SEE SH 3)
DETAIL 3 (SEE SH 3)
DETAIL 2 (SEE SH 3)
(24.00)
SEE NOTE
SEE NOTE
DETAIL 1 (SEE SH 3)
GMAW TYP
1/2 TYP
VIEW C-C
SCALE: 1/4 = 1
3
1 1/4
1 1/4
3
GMAW
17/32
TYP SECTION D-D
SCALE: 1 = 1
MIL-S (DOES NOT APPLY)
DAY & ZIMMERMANN, INC.
LONE STAR DIVISION
OPERATOR OF LONE STAR ARMY AMMUNITION PLANT
UB-850
KING
SEE NOTED
BARRICADE FOR PRESSURE CARTRIDGE FOR VOLCANO-MORMS (PROTOTYPE PYROTECHNIC TEST ONLY)
SKC-2515
REVISIONS
DATE


DETAIL 1 OF
DETAIL 2 OF
DETAIL 3 OF
DETAIL 4 OF
TYP SECTION E-E (13 PLACES)
SCALE: 1 = 1
DAY & ZIMMERMANN, INC.
BARRICADE FOR PRESSURE CARTRIDGE FOR VOLCANO-MORMS
(PROTOTYPE EXPLOSIVE TEST ONLY)
SKC-2515


50.00
49.00
41.00
33.00
25.00
17.00
9.00
1.00
1.50
(.47)
.03
3.00
.00
.50
3/16 X 45°
13/32
7 REQD
GUIDE RAIL (B)
MATL: M-1030 MRS
SCALE: 1/2 = 1
REQD: 2
FINISH: 1 COAT RED PRIMER
23.50
23.00
15.50
8.00
.50
2.00
1.00
13/32
4 REQD
STOP BAR (C)
MATL: 1"THK M-1030 MRS
SCALE: 1/2 = 1
REQD: 2
FINISH: 1 COAT RED PRIMER
27.00
26.00
21.00
16.00
11.00
8.00
1.00
1.50
(.47)
1.03
3.00
.00
.50
13/32
8 REQD
GUIDE RAIL (D)
MATL: M-1030 MRS
SCALE: 1/2 = 1
REQD: 2
FINISH: 1 COAT RED PRIMER
38.00
36.00
29.79
19.39
10.25
1.00
1.50
(.47)
1.03
3.00
.03
.50
13/32
5 REQD
GUIDE RAIL (E)
MATL: M-1030 MRS
SCALE: 1/2 = 1
REQD: 2
FINISH: 1 COAT RED PRIMER
MIL-S
DAY & ZIMMERMANN, INC.
LONE STAR DIVISION
BARRICADE FOR
PRESSURE CARTRIDGE
FOR VOLCANO-MORTAR
(PROTOTYPE FOR EXPLOSIVE
TEST ONLY)
SKL-2515


1/2-13 UNC X 3/4 DP
1.00
.50
11.00
22.00
14.50
15.00
14.00
11.00
8.00
7.00
6.50
8.50
9.00
10.00
14.00
18.00
19.00
19.50
28.00
1/4-20 UNC X 1/2 DP
FLAT BOT TAP
8 REQD
1/2 RAD TYP
FRONT DOOR (F)
MATL: M-1020 HRS
SCALE: 1/2 = 1
REQD: 1
FINISH: 1 COAT RED PRIMER
A
B
C
1.00
2.00
13/32
3 REQD
STOP BAR (G) & (H)
MATL: 1"THK M-1020 HRS
SCALE: 1/2 = 1
REQD: 6 (SEE SCHEDULE)
FINISH: 1 COAT RED PRIMER
SCHEDULE
PERM | A | B | C | D | E
G | .75 | 8.00 | 13.25 | 10.00 | 1
H | .75 | 7.00 | 13.25 | 14.00 | 1
1/2-13 UNC X 3/4 DP
1.00
.50
8.00
12.00
1/2 RAD TYP
34.00
SIDE DOOR (J)
MATL: M-1020 HRS
SCALE: 1/2 = 1
REQD: 1
FINISH: 1 COAT RED PRIMER
1/2-13 UNC X 3/4 DP
1.00
.50
7.00
14.00
1/2 RAD TYP
18.00
SIDE DOOR (K)
MATL: M-1020 HRS
SCALE: 1/2 = 1
REQD: 1
FINISH: 1 COAT RED PRIMER
DAY & ZIMMERMANN, INC.
LONE STAR DIVISION
LONE STAR ARMY AMMUNITION PLANT
MIL-Q DOES NOT APPLY
BARRICADE FOR PRESSURE CARTRIDGE FOR VOLCANO-MOPMS
(PROTOTYPE P/EXPLOSIVE TEST ONLY)
SKC-2515


1/2 RAD TYP
12.00
11.50
10.50
8.00
1.50
.50
1/4
5.00
8.50
9.50
10.00
RETAINING PLATE (L)
MATL: M-1020 MRS
SCALE: 1/2 = 1
REQD: 2
FINISH: 1 COAT RED PRIMER
12.00
11.50
8.00
.50
5.00
9.50
10.00
OUTER WINDOW (M)
MATL: 3/8 THK LEXAN
SCALE: 1/2 = 1
REQD: 1
1/2 RAD TYP
9.83
7.83
INNER WINDOW (N)
MATL: 1/2 THK LEXAN
SCALE: 1/2 = 1
REQD: 1
8 DIA
12
4
1 TYP
(2)
3.00 X .065 WALL THKNS
3003-H14 AL RND TUBING
MIN BEND RAD
TYP
NOTE:
ALL WELD CONSTRUCTION
3.00
1.50
7/32 DIA-2 REQD
.50 TYP
POWDER FUNNEL (P)
MATL: 1/16 THK 6061-T6 AL
& NOTED
SCALE: 1/2 = 1
REQD: 1
8 1/2
2.00 X .065 WALL THKNS
3003-H14 AL RND TUBING
MIN BEND RAD
TYP
1 TYP
(2)
4
NOTE:
ALL WELD CONSTRUCTION
3.00
1.50
.50 TYP
7/32 DIA-2 REQD
POWDER FUNNEL (Q)
MATL: 1/16 THK 6061-T6 AL
& NOTED
SCALE: 1/2 = 1
REQD: 1
7.75
3.50
2.00
.50
9/32 DIA-2 REQD
1 DIA-2 REQD
2.25
1.12
.37
1.87
.75
#10-24 UNC X 3/8
DP-4 REQD
5.00
8.50
8.00
8.50
8.50
2.00
1/4 DIA-2 REQD
1.00
.50
SLIDE BAR (R)
MATL: 6061-T6 AL
SCALE: 1 = 1
REQD: 1
MIL-Q DOES NOT APPLY
DAY & ZIMMERMANN, INC.
LONE STAR DIVISION
LONE STAR ARMY AMMUNITION PLANT
BARRICADE FOR PRESSURE CARTRIDGE FOR VOLCANO-HOPHS (PROTOTYPE P/EXPLOSIVE TEST ONLY)
SKC-2515
0



MIL-Q DOES NOT APPLY	DAY & ZIMMERMANN, INC. LONE STAR DIVISION OPERATOR OF LONE STAR ARMY AMMUNITION PLANT
88-050	BARRICADE FOR PRESSURE CARTRIDGE FOR VOLCANO-MOPMS (PROTOTYPE P/EXPLOSIVE TEST ONLY)
KING NOTED	
	SKC-2515 REV 0

7-8